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ABSTRACT

Education in contemporary society is no longer the selective enterprise for which a product evaluation approach is appropriate. Process evaluation, however, complements a new view of education--education offers all students opportunities for individual growth. A process approach focuses on what is understood. Focusing on learning activity and targeting behavior, it accounts for the interaction of knowledge, skills, and perceptions as they emerge in a learning process. Opponents of process evaluation believe it is in conflict with the structure of schools, but research does not support this idea. Process evaluation is also often thought to lack standards, but, in fact, its standards are grounded in cognitive psychology and the concepts of systems testing. A final argument against process evaluation has been that it conflicts with the traditional aims of education. Measurement, however, must evolve to suit today's education, which promises the development of individual skills. While many recognize the value of process evaluation, its application to large-scale programs will require sound research, collaboration between research and practice, the implementation of pilot programs, and national networking for information dissemination. (Contains 44 references.) (SLD)

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ISSUES IN EVALUATION: TOWARDS THE LARGE-SCALE IMPLEMENTATION OF PROCESS ASSESSMENT

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INTRODUCTION

Instruction and evaluation in educational systems should constitute an integral event (Glaser, 1981). This principle is realized in process-oriented classes where the monitoring of students' understanding of their skills guides the curriculum (Atwell, 1987; Brandt, 1990). In the last decade, many educators have altered classroom instruction in this manner, applying the insights of cognitive research. The techniques they practice, however, conflict with the external testing institutions typically employ to measure information acquired or general abilities and to compare student performance across time, districts, and the nation. On the surface, process assessment appears inadequate for stimulating such discussions about students, particularly when diversity in education is increasing. Education in our contemporary society, however, is no longer the selective enterprise for which a product approach is appropriate. Today, less emphasis is placed on selecting individuals for available educational opportunities, and more attention is devoted to offering all students individual opportunities for growth (Glaser, 1981). Process evaluation complements this new view of education. In this paper, I address the issues surrounding this approach to evaluation,

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argue against common misconceptions which impede implementation, and consider what might be done to facilitate large-scale process testing.

THE ADVANTAGES OF PROCESS EVALUATION AS IT OPPOSES PRODUCT MEASUREMENT

The controversy surrounding assessment in education reflects the fundamental debate over product and process approaches to teaching (Dewey, 1938). In a product-oriented environment, instruction focuses on the reproduction of information, and evaluation measures general skills and the short term retention of isolated points. A process approach, in contrast, focuses on what is understood. The content of a particular domain is organized and structured within a meaningful frame of reference (Bowden, 1986). Evaluation in this setting consists of the ongoing monitoring of skills, perceptions, and performance by both teachers and students (Anstey and Ball, 1991).

Product evaluation is a tradition in American education. For almost a century, it appeared both appropriate and efficient, given the enormity of compulsory education in America and its initial aim: the transmission of organized bodies of knowledge and prepared skills (Cremin, 1988). Within this framework, the focus of evaluation rests outside the classroom experience. Assessment measures the information and prepared skills targeted, most often through objective testing. This efficient practice accommodates the ranking of students, thus satisfying the desire to compare the outcomes of education across

individuals, schools, and districts on a nation-wide basis (Paris, Lawton, Turner, and Roth, 1991). Entrenched in America's educational tradition, this orientation is, however, outdated. Grounded in education of the past, it assumes that cognition and learning can be separated from the act of acquiring and applying skills (Resnick and Resnick, 1989).

Paris, Lawton, Turner, and Roth (1991) describe the cumulative effects of external testing. Confronted with external, decontextualized assessment, experienced adolescent students are more likely to cheat, to become nervous, to have difficulty concentrating, and to guess than elementary students are. Low achievers, in particular, appear hostile and withdrawn by the adolescent years, manifesting the effects of almost a decade of testing in which they competed against others rather than competing with themselves. Haladyna, Nolen, and Haas (1991) add that external testing reifies learning processes and expresses a year's worth, or even a career's worth, of study in two or three digit numbers. These figures attribute achievements or failures influencing placement and progress to a single moment; to a single teacher, school, or district; and /or to a mere sampling or manipulation of the curriculum.

Process evaluation reflects a different perspective on measuring student performance. Focusing on learning activity and targeting behavior, it accounts for the interaction of knowledge, skills, and perceptions as they emerge in a learning process (Nickerson, Perkins, and Smith, 1985). Evaluation involves the monitoring of skills. Monitoring fits learning as

it is shaped. It aims to intervene--to facilitate and direct developing skills and overall performance rather than to identify a need to "re-learn" something or to correct serious deviations in performance (Goodman, 1989). In classrooms, teachers introduce, explicitly, the knowledge and skills associated with learning in specific domains to stimulate monitoring activity (Siegler, 1986). They situate these skills in meaningful contexts to trigger student response (Perkins and Salomon, 1989). Visible in the materials and activities of the classroom are the essential components comprising the skills taught (Frederiksen and Collins, 1989). Framing learning experiences, these offer students clear reference points against which they can judge their own work and through which they can understand teachers' judgments (Bowden, 1986).

Monitoring is grounded in learning activities--opportunities to apply information. These activities include verbal activity, the act of answering questions and participating in discussions, debate, or role play; written work, the process of preparing texts which describe, explore, analyze, or critique the subject matter under study; and goal-directed actions, such as problem-solving, inquiry, the construction of models, displays, or portfolios, and even formal testing (Brophy and Alleman, 1991). Rather than being evaluated with little sense of the purposes measurement serves, students develop an understanding of their capabilities and the utility of the information they study (Goodman, 1989).

The benefits of process-oriented learning experiences which integrate instruction and evaluation are many. They make the content studied and the skills employed both visible and intelligible. Linking course material with personal experiences, they trigger the internal processes which guide students to assess themselves (Glaser, 1987). The approach is significant, then, because it isolates and measures knowledge and skills directly rather than decontextualizing and manipulating them (Frederiksen and Collins, 1989). However, the unique focus this approach adopts offers an unfamiliar perspective on student performance. Student-centered and skills-oriented, process evaluation on the classroom level appears so idiosyncratic that both administrators and educators find its large-scale implementation difficult to envision.

AN ARGUMENT AGAINST COMMON MISCONCEPTIONS

Several factors explain why a movement to alter the focus of assessment has not yet occurred. First, misconceptions regarding process evaluation exist. Opponents often perceive it to be in conflict with the structure of the school day, standards, and the aims of education. These misconceptions point to a basic misunderstanding of the nature of process evaluation as it reflects research on cognition and contemporary views on education.

The common misconception that process evaluation is in conflict with the structure of schools is grounded in the belief

that implementation will require the blurring of grade levels and content areas (Dewey, 1938). No support for these claims can be found in empirical studies of process learning, however. Process evaluation measures both information (declarative knowledge) and mental processes (procedural and meta knowledge) (Glaser, 1987). Research indicates that mental processes, though they may not be entirely stage-based, progress over the course of time (Damon, 1983). The levels typically associated with schooling, therefore, are not in conflict with learning programs which target developing skills. Additionally, current research on cognitive development (e.g., Brown, Collins, and Duguid, 1989; Siegler, 1986) indicates that mental processes are grounded in specific knowledge-rich contexts. A specified, focused knowledge base offers the foundation upon which skills can be exercised and knowledge from other areas triggered and integrated. The domains organizing formal education offer a framework for cognitive growth. This framework is most effective when it situates domain-specific knowledge and skills in authentic activity (Brown, Collins, and Duguid, 1989).

Another misunderstanding regarding process evaluation is that it lacks standards (Nunan, 1988). Skeptics feel that parameters for discussing students on a large scale cannot exist in a setting which focuses on activity rather than external objectives. If process evaluation were implemented, therefore, society's discussions of academic progress across students would no longer be possible. A careful examination of process evaluation indicates, however, that it is, indeed, governed by

standards. Accounting for the interaction of knowledge and skills, its standards are grounded in cognitive psychology rather than the organized bodies of knowledge constituting the various domains (Glaser, 1981).

Theories on process testing (e.g., Frederiksen and Collins, 1989) describe certain standards and components. Systems testing measures procedural and meta knowledge and attends to learners' outcomes (David, 1991). It examines what individuals are capable of doing rather than identifying only those who will be successful performers (Glaser, 1981). To assess growth, careful analyses of learning activities in the disciplines are necessary (Frederiksen and Collins, 1989). These decompose complex skills into their component procedures and required knowledge, identifying the skills particular learning activities involve (Siegler, 1986). Aware of all possible knowledge, skills, and strategies required to perform well in targeted activities, both students and teachers can measure performance and understand ways to improve it (Frederiksen and Collins, 1989). This type of evaluation achieves systemic validity; it measures directly that which is taught. While this approach focuses on individual performances across multiple learning activities, scoring systems for standardizing it are possible. The primary trait scoring system introduced in research on writing (Lloyd-Jones, 1977) offers direction for their design.

The primary traits of a specific writing task consist of the knowledge and skills necessary to complete the task. A "how-to" essay, for example, involves knowledge about the specific topic,

knowledge about the use of second person and temporal transition words, and the ability to sequence information logically. From these and other primary traits essential to the task, a scoring system and models of the task can be constructed. For primary trait scoring, the rater gives scores (points on a scale ranging from 1 to 6, for example) based on criteria that have been established through task analysis. The criteria vary from one type of writing to another and are therefore rhetorically-based.

From the detailed criteria organizing primary trait scoring in various domains, examplars of tasks can be constructed. These concrete, transparent, meaningful models of a task, as it may be executed over the course of time across individual, orient teachers to the criteria for judging student performance and students to the manner in which they will be evaluated. Depicting learning activity, examplars may consist of portfolios of written work or art work, video clips of presentations or projects, or a set of computer programs, for example. Offering the information which guides learning and evaluation and measuring skills directly, systems testing is superior to product evaluation, whose unspecified dimensions lack systemic validity (Frederiksen and Collins, 1989).

The final claim against process evaluation is that it appears to be in conflict with the traditional aims of education. Without doubt, process evaluation opposes the purpose of early compulsory education in America--the transmission of fixed bodies of knowledge and prepared skills (Dewey, 1938). Over time, however, this goal has been altered to complement both a

rapidly changing society and insights on learning. Since today's education promises the development of individual skills in a manner permitting ongoing adaptation in society, measurement must evolve through educational experiences rather than be imposed upon them (Chipman and Segal, 1985).

Theoretical perspectives describe process evaluation, yet the approach remains elusive because it focuses on abstract mental constructs. Integrated into individual classrooms and automatic to instructors who practice it, the specific features of process evaluation are often difficult to separate from the language of schools or psychology. While this type of evaluation becomes "wooly" in discussions of abstract cognitive functions, a familiar experience outside the field highlights some of its features.

Certain standards exist for issuing licenses to new drivers. While manuals are read and written tests are taken, the final decision regarding a person's driving skills rests with a process exam--the road test. An examiner rides with the new driver, monitoring his/her execution of certain essential tasks. The necessary skills include judgments and decisions--the application of knowledge about the rules of the road. Evaluators can assess a new driver's skills because they have isolated the subskills and tasks which constitute good driving. The examiners observe the execution of required maneuvers listed on the scoring sheet, awarding points for subtasks performed successfully.

The preceding example exposes significant points about the large-scale implementation of process evaluation. First, the central issue surrounding evaluation does not appear to be its standardization but, rather, its orientation to product or recall and/or the manipulation of skills. This point suggests that the development of large-scale process assessment measures may not necessarily warrant a radical change in the form testing adopts. Perhaps test items which focus on dilemmas in meaningful contexts aligned with the curriculum can be written as objective questions. Whether process testing can adopt this traditional form while shifting its focus is a critical issue research exploring large-scale implementation must investigate. Second, while evaluation which targets skills and processes appears subject to the idiosyncrasies of teachers and students, the road test demonstrates that certain fundamental processes involving the use of domain-specific knowledge remain constant, despite individual variation. This insight also guides the development of suitable measures.

TOWARD LARGE-SCALE PROCESS EVALUATION: ISSUES AND AGENDAS

Process instruction has gained attention as a pedagogically-sound approach, whose focus is consistent with contemporary thought on the aims of education. However, the gap separating this type of learning from existing large-scale external evaluation is detrimental to students, teachers, schools. A movement to alter large-scale assessment is both

important and timely. Its success rests with a sound research agenda, the collaborative efforts of research and practice, pilot programs, and national networking.

The research targeting large-scale implementation must describe, in detail, the qualitative progression of skills educational systems will measure over the course of time (Glaser, 1987). This information will be necessary to identify the performance levels of individuals in diverse settings and to direct their progress. Existing cognitively-oriented explanations of general skills development (e.g., Sternberg, 1977) will contribute to this awareness; they will not, however, provide all the information needed to develop a system for evaluating skills.

An understanding of cognition, as it is situated within the experiences of individuals, various domains, and multiple settings for learning, is essential to the development of large-scale measurement procedures. Since contemporary research stresses the significance of knowledge and experience, with its rich descriptions of expertise in various domains (e.g., Chi, Feltovich, and Glaser, 1981; Flower and Hayes, 1986; Frederiksen and Collins, 1989), the manner in which the academic disciplines trigger thinking is a topic to explore. Contrasting the cognitive models which depict general skills, those which capture the interaction of skills and knowledge in specific domains across levels will be aligned with the curriculum of process learning. Within these interactive models, the problem-solving activity, sequential processes, and other skills

characterizing the procedural knowledge of certain domains may be detected. This information will offer insights on how to construct test items might be constructed and how to organize evaluation measures. The domain-specific models may also point to certain processes common to activities across domains that testing might target. In this cognitively-oriented research on evaluation, other questions or concerns follow logically. Whether testing must be individualized, whether language contributes to or confounds process evaluation, and the role technology might play in the "scanning" of sustained rather than objective responses to test items are state-of-the-art issues warranting investigation.

Also included in the research agenda are efforts to understand the role product evaluation plays in learning. Since literature on cognitive development stresses the significance of domain-specific knowledge (Perkins and Salomon, 1989), the information students possess is essential to instruction. While product evaluation cannot dominate educational systems oriented to process (Glaser, 1981), information acquired is an essential element which cannot be neglected. Through the careful task analyses, pilot programs, and observations conducted in schools, an understanding of how product evaluation is integrated into process programs is likely to emerge.

If the findings of this agenda are to have a clear impact on educational practice, then the agenda itself must be grounded in the collaborative efforts of research and practice. Only through an analysis of what occurs in process classrooms can one

begin to understand that which must be measured and the diverse populations who will be subject to measurement. When research is linked to the classroom, the procedures teachers intuitively adopt can be perceived, analyzed, and evaluated by research teams. They will learn, for example, whether a process orientation to evaluation can be retained even in short answer or objective questions. Also, through this collaborative effort, the individual differences testing must accommodate can be detected. This information will facilitate discussions about the form testing might take to minimize bias and to capitalize on individual differences while measuring performance against typical patterns of growth. In addition, the range of performances students might demonstrate are visible in the classroom, offering insights on how and why individuals adopt different approaches for completing similar tasks.

The benefits of this collaborative investigation of skills will extend to educational practice itself in a manner benefiting the research effort. Involved in cognitively-oriented analyses of the tasks comprising the curriculum, teachers in various domains will understand better the nature of the skills they target. This information will enhance their ability to design suitable learning activities, to present them explicitly to students, and to monitor their development. As research directs the organization of process learning, the resulting improvements in instruction will strengthen the overall effort to analyze the classroom experience from a cognitive perspective.

Small-scale pilot projects in the process classroom will provide the framework through which appropriate measures will be discovered. Directly involved with learning experiences, project directors will observe and analyze the authentic problems and dilemmas testing must parallel. They will administer multiple representations of seemingly appropriate test items in the classroom, formally and informally, to test their validity and to explore issues regarding the standardization. The pilot programs will include data comparing students' performance in classroom activity with the scores experimental measures yield. This information, complemented by observation of and interviews with students, will provide insights on the apparent validity of experimental measures and the effects they have on individual learners. If pilot programs reflect a mission of experimentation, discovery, and modification, then evaluation will be shaped by instruction in the tradition of process learning. Rather than imposing arbitrary, external objectives, evaluation will grow out of insights on cognitive activity and development.

The findings of small-scale programs will be more informative than generalizable, yet they are essential if attempts to reform large-scale evaluation are to continue. A strong network of communication through which insights on assessment are shared is a necessary complement for sustaining the effort. Since research findings must be accessible to both teachers and researchers, given the cognitive focus and practical aims of the research agenda, they should not be limited to publications on

education in general or to technical psychology journals. With new insights on testing focusing on the learning context and the content areas, national and regional organizations of teachers in the disciplines offer a means for broadening the scope of the research effort. Exchanges among professionals will point to the significance of the research agenda, ways to apply its findings, and any modifications which appear appropriate. Only through a strong network of communication reaching both theoreticians and educators can a movement to alter evaluation gain momentum.

A process approach to learning illustrates theory in practice. Process learning narrows the gap separating research efforts and the classroom experience. While a product approach reinforces the separation of these (behavior constituting a research concern and the transmission of information an educational objective), process learning does not. It attempts to reconcile theories about what should occur in education with the accounts of what actually transpires in the classroom.

CONCLUSION

With process instruction gaining momentum in individual classrooms, the time has come to organize the standards underlying this instructional approach to facilitate the large-scale implementation of suitable assessment measures. While process evaluation might appear difficult to apply on a large scale, given its focus on individuals and activity, a

review of the literature indicates that an effort to achieve this new vision of assessment has been developing for two decades. Introducing process learning, an approach contemporary society has demanded, research and education have prepared us for a new way of speaking about learning and student progress. This shift in the focus of evaluation represents a critical, necessary change in education, given the problems threatening it today. The large-scale implementation of process evaluation will unify discussions of students, drawing from a literature on growth and development. Aligning educational experiences, the social context, and cognitive research, this shift in the focus of assessment will reconcile instruction and evaluation, making education an integral event, and it will focus on individual learners, offering them opportunities for growth.

References

Anstey, M., & Ball, G. (1989). From teaching to learning: Translating monitoring into planning and practice. In E. Daly, (Ed.), Monitoring children's language development. Portsmouth: Heineman.

Atwell, N. (1987). In the middle: Writing, reading, and learning with adolescents. Upper Montclair: Boynton/Cook.

Blum, R. E., & Kneidek, A. W. (1991). Strategic improvement that focuses on student achievement. Educational Leadership, 7, 17-21.

Bowden, J. D. (1986). Student learning: Research in practice. Parkville: University of Melbourne.

Brandt, D. (1990). Literacy as involvement: The acts of writers, readers, and texts. Carbondale: Southern Illinois University Press.

Brophy, J., & Alleman, J. (1991). Activities as instructional tools: A framework for analysis and evaluation. Educational Researcher, 20, 9-22.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18, 32-44.

Chi, M. T. H., Feltovich, P., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. Cognitive Science, 5, 121-152.

Chipman, S., & Segal, J. (1985). Higher cognitive goals for education: An introduction. In S. Chipman, J. Segal, & R. Glaser (Eds.), Thinking and learning skills: Research and open questions (Vol. 2, pp. 1-18). Hillsdale: Erlbaum.

Connell, J. (1991). Context, self, and action: A motivational analysis of self-system processes across the life-span. In D. Cicchetti & M. Beeghly (Eds.), The self in transition: Infancy to childhood. Chicago: University Press.

Cremin, L. (1988). American education: The metropolitan experience. NY: Harper and Row.

Damon, W. (1983). Social and personality development. NY: W. W. Norton and Co.

David, J. L. (1991). What it takes to restructure education.

Educational Leadership, 8, 11-15.

Dewey, J. (1916). Democracy and education. NY: Macmillan.
_____. (1938). Education and experience. Chicago: University Press

Fitzpatrick, K. (1991). Restructuring to achieve outcomes of significance for all students. Educational Leadership, 8, 18-22.

Flower, L. (1979). Writer-based prose: A cognitive basis for problems in writing. College English, 41, 19-37.

Flower, L., & Hayes, J. R. (1980a). The cognition of discovery: Defining a rhetorical problem. College Composition and Communication, 31, 21-32.
_____. (1980b). The dynamics of composing: Making plans and juggling constraints. In L. Gregg and E. R. Steinberg (Eds.), Cognitive processes in writing (pp. 31-50). Hillsdale: Erlbaum.
_____. (1981). A cognitive process theory of writing. College Composition and Communication, 4, 365-387.
_____. (1986). Writing research and the writer. American Psychologist, 41, 1106-1113.

Frederiksen, J. R., & Collins, A. (1989). A systems theory of testing. Educational Researcher, 18, 27-32.

Frederiksen, J. R., & Warren, B. (1987). A cognitive framework for developing expertise in reading. In R. Glaser (Ed.), Advances in instructional psychology (Vol 3, pp. 1-40). Hillsdale: Erlbaum.

Frederiksen, N. (1984). The real test bias. American Psychologist, 39, 193-202.

Freire, P. (1970). Pedagogy of the oppressed. NY: Seabury.

Glaser, R. (1981). The future of testing: A research agenda for cognitive psychology and psychometrics. American Psychologist, 36, 923-936.
_____. (1987). (Ed.) Advances in instructional psychology (Vol 3). Hillsdale: Erlbaum.

Goodman, Y. M. (1989). Evaluation of students. In K. Goodman, Y. Goodman, & W. Hood (Eds.), The whole language evaluation book. Portsmouth: Heineman.

Kemp, M. (1987). Watching children read and write. Portsmouth: Heineman.

Krupa, M., Selman, R., & Jaquette, D. (1985). The development of science explanations in children and adolescents: A

structural approach. In S. Chipman & J. Segal (Eds.), Thinking and learning skills: Research and open questions (Vol 2, pp. 407-455). Hillsdale: Erlbaum.

Linn, R. (1986). Educational testing and assessment: Research needs and policy issues. American Psychologist, 41, 1153-1160.

Lloyd-Jones, R. (1977). Primary trait scoring. In C. Cooper & L. Odell (Eds.), Evaluating writing. Urbana, IL: NCTE.

Haladyna, T., Nolen, S. B., & Haas, N. S. (1991). Raising standardized achievement test scores and the origins of test score pollution. Educational Researcher, 20, 2-7.

Nunan, D. (1988). The learner-centered curriculum: A study in second language teaching. NY: Cambridge University Press.

Ohlsson, S., & Rees, E. (1991). The function of conceptual understanding in the learning of arithmetic procedures. Cognition and Instruction, 8, 103-179.

Paris, S., Lawton, T., Turner, J., & Roth, J. (1991). A developmental perspective on standardized achievement testing. Educational Researcher, 20, 12-19.

Perkins, D. N., & Salomon, G. (1989). Are cognitive skills context-bound? Educational Researcher, 18, 16-25.

Resnick, L. B., & Resnick, D. P. (1989). Tests as standards of achievement in school. In Proceedings of ETS Invitational Conference: The uses of standardized tests in American education (pp. 63-80). Princeton: NJ: Educational Testing Services.

Rosenbaum, J. E. (1978). The structure of opportunity in school. Social Forces, 57, 236-256.

Schoenfeld, A. H. (1985). Mathematical problem solving. NY: Academic Press.

Shor, I. (1987). Freire for the classroom: A sourcebook for liberatory teaching. Portsmouth: Boynton/Cook.

Siegler, R. (1986). Children's thinking. Englewood Cliffs, NJ: Prentice-Hall.

Smith, M. L. (1991). Put to the test: The effects of external testing on teachers. Educational Researcher, 20, 8-20.

Sternberg, R. (1977). Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities. Hillsdale: Erlbaum.